

General Mathematics

Solutions and marking guidelines

Section I

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|-----|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
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| 2. | A <input type="radio"/> | B <input type="radio"/> | C <input checked="" type="radio"/> | D <input type="radio"/> |
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| 5. | A <input type="radio"/> | B <input type="radio"/> | C <input checked="" type="radio"/> | D <input type="radio"/> |
| 6. | A <input type="radio"/> | B <input checked="" type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
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| 13. | A <input checked="" type="radio"/> | B <input type="radio"/> | C <input type="radio"/> | D <input type="radio"/> |
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| 22. | A <input type="radio"/> | B <input type="radio"/> | C <input checked="" type="radio"/> | D <input type="radio"/> |

Section I (continued)

	Answer and explanation	Content area assessed	Outcomes assessed
Question 1	B Range of girls' heights = $180 - 156 = 24$	DA3	P9
Question 2	C Mark down of 20% = 80% of marked price. \therefore Cost price = 80% of \$70.00 = \$56.00	FM1	P2
Question 3	B 0.003 is the value written to 3 decimal places.	M1	P2, P7
Question 4	C For the given triangle: $\sin \alpha = \frac{3}{5}$ $\sin \beta = \frac{4}{5}$ $\cos \alpha = \frac{4}{5}$ $\cos \beta = \frac{3}{5}$ Therefore, incorrect statement is C.	M4	P2, P6
Question 5	C 7 different cards in the first position, then 6 different cards in the second position and so on. Therefore, the number of different ways = $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$	PB1	P10
Question 6	B $2a(a + 1) - 3(a - 3) = 2a^2 + 2a - 3a + 9$ $= 2a^2 - a + 9$	AM3	H4
Question 7	B $n = 1.5 \text{ years} = 18 \text{ months}$ $r = 2\% = 0.02$ $PV = \$1200$ $FV = \$1200 \times (1 - 0.02)^{18}$ $= \$1200 \times (0.98)^{18}$ $= \$834.16$	FM6	H8
Question 8	D Shay earns: $10 \text{ hours} \times \$12.00/\text{h} + 6 \text{ hours} \times (\$12.00 \times 1.5)/\text{h}$ $= \$120 + \108 $= \$228$	FM1	P8
Question 9	D $\pi \times r^2 = 45 \text{ cm}^2$ $\therefore r = \sqrt{\frac{45}{\pi}} \text{ cm}$	M5	H6

Section I (continued)

Answer and explanation	Content area assessed	Outcomes assessed
<p>Question 10 B</p> <p>Stamp measures 5 ± 0.5 cm by 3 ± 0.5 cm. Therefore minimum possible measurements are 4.5 cm by 2.5 cm. Therefore minimum possible area = $4.5 \text{ cm} \times 2.5 \text{ cm} = 11.25 \text{ cm}^2$.</p>	M2	P7
<p>Question 11 D</p> <p>Number of possible teams is ${}^{12}C_7 = 792$.</p>	PB3	H10
<p>Question 12 A</p> <p>Lee: z-score General maths = $\frac{61 - 55}{12} = 0.5$ Lee: z-score Senior Science = $\frac{70 - 75}{10} = -0.5$ Sue: z-score General maths = $\frac{49 - 55}{12} = -0.5$ Sue: z-score Senior Science = $\frac{65 - 75}{10} = -1$</p> <p>Therefore Lee's General Maths score is best as it is the only one above the mean score for that test.</p>	DA6	H9
<p>Question 13 A</p> <p>Volume of water $\pi \times \left(\frac{2.5}{2}\right)^2 \times 0.05 = 0.2454369 \text{ m}^3$ $= 0.2454369 \times 1000 \text{ L}$ $= 245.44 \text{ L}$ $= 200 \text{ L to nearest 100 Litres}$</p>	M5	H6
<p>Question 14 D</p> <p>The two directions are perpendicular to each other and equidistant from starting point. Therefore C is due South of D. Therefore the bearing of C from D is 180°.</p>	M6	H6
<p>Question 15 A</p> <p>Taxable income = $\\$82\,000 - \\$2\,500 = \\$79\,500$ Tax payable = $\\$4\,200 + \\$0.03 \times (\\$79\,500 - \\$34\,000) = \\$17\,850$</p>	FM3	P8
<p>Question 16 B</p> <p>Scores of 39 and 91 are two standard deviations away from the mean if representing 95% of student scores. \therefore Standard deviation = $\frac{91 - 65}{2} = 13$ \therefore Score of 52 is $\frac{52 - 65}{13} = 1$ standard deviation below the mean. \therefore Scores lower than 1 standard deviation below the mean = 16% of the student scores.</p>	DA6	H9

Section I (continued)

Answer and explanation	Content area assessed	Outcomes assessed
<p>Question 17 A</p> $2\pi r^2 + 2\pi rh = S$ $2\pi rh = S - 2\pi r^2$ $h = \frac{S - 2\pi r^2}{2\pi r}$	AM3	H2
<p>Question 18 D</p> $d = kv^2$ $k = \frac{d}{v^2}$ $k = \frac{45}{90^2}$ $k = \frac{1}{180}$ $180d = v^2$	AM4	H4
<p>Question 19 C</p> $AC^2 = AO^2 + OC^2 - 2 \times AO \times OC \times \cos(68^\circ 24' + 79^\circ 15')$ $= (16.5)^2 + (23)^2 - 2 \times 16.5 \times 23 \times \cos(147^\circ 39')$ $= 1442.449558$ $AC = \sqrt{1442.449558}$ $= 37.98 \text{ m to 1 decimal place}$	M6	H6
<p>Question 20 A</p> <p>Upper quartile score = $\frac{(30 + 36)}{2} = 33$</p> <p>Lower quartile score = $\frac{(6 + 12)}{2} = 9$</p> <p>Therefore interquartile range = $33 - 9 = 24$</p>	DA5	H9
<p>Question 21 A</p> $G = \frac{\sqrt{3 \times (3)^2 + 2 \times 3 - 1}}{(5 \times 3 - 3)^3}$ $G = 0.003273642505$ $G = 0.003274 \text{ to 4 significant figures}$	AM3	H2
<p>Question 22 C</p> $\$150\,000 = M \left[\frac{(1 + 0.005)^{36} - 1}{0.005} \right]$ $M = \$150\,000 \div 39.33610496$ $M = \$3813.29$	FM5	H8

Section II.

Question 23

Sample answer	Syllabus outcomes and marking guide
(a) (i) mean = 65, standard deviation = 4.4	DA4 P9 <ul style="list-style-type: none"> Correctly gives both values 2 Correctly gives one of the two values . . . 1
(ii) The range for Music students ($72 - 58 = 14$) is smaller than the range for Economics ($94 - 42 = 52$). IQR for Music and Economics are similar.	DA5 H9 <ul style="list-style-type: none"> Correctly compares range and IQR for the two sets of scores 2 Correctly gives reference to the range or IQR for the two sets of scores 1
(b) (i) $72 - 15 = 57$	DA6 H9 <ul style="list-style-type: none"> Correctly gives score 1
(ii) $z = \frac{93 - 72}{10} = 2.1$	DA6 H9 <ul style="list-style-type: none"> Correctly gives z-score 1
(iii) $-2.4 = \frac{x - 72}{10}$ $x = 72 - 24$ $= 48$	DA6 H9 <ul style="list-style-type: none"> Correctly gives score 2 Correctly substitutes values into z-score formula 1
(c) Correlation means that there is an association between two variables. In this case, there was a relationship between hours spent partying and the amount of study that a student did.	DA7 H9 <ul style="list-style-type: none"> Gives explanation making reference to association or relationship 1
(d) (i) <div style="margin-left: 40px;"> </div> <p style="margin-left: 40px;">P(winning Second Prize)</p> $= \left(\frac{2}{500} \times \frac{1}{499}\right) + \left(\frac{498}{500} \times \frac{2}{499}\right)$ $= \frac{1}{250}$	PB3 H2, H10, H11 <ul style="list-style-type: none"> Correctly shows tree diagram and probability 2 Makes a substantial attempt towards achieving the answer including a correct tree diagram 1
(ii) Financial Expectation $= [P(\text{win win}) \times \$350 + P(\text{win lose}) \times \250 $+ P(\text{lose win}) \times \$100 - P(\text{lose lose}) \times \$2]$ $= \left[\left(\frac{1}{124750} \times \$350\right) + \left(\frac{249}{62375} \times \$250\right)\right.$ $\left. + \left(\frac{249}{62375} \times \$100\right)\right] - \left(\frac{247506}{249500} \times \$2\right)$ $= \$\left(\frac{7}{2495} + \frac{498}{499} + \frac{996}{2495} - 1.984016032\right)$ $= -\$0.58$	PB4 H2, H10, H11 <ul style="list-style-type: none"> Correctly gives financial expectation . . . 2 Correctly gives calculations without subtraction of ticket price. <p>OR</p> <ul style="list-style-type: none"> Includes subtraction of ticket price from incorrect calculations 1

Question 24

Sample answer	Syllabus outcomes and marking guide
(a) (i) $P(\text{winning}) = \frac{1}{24}$, assumes that all horses have an equal chance of winning. There are many other factors that need to be considered: age, weight, trainer, track, breeding etc. Therefore, unless all these other factors are equal, it is not true to say a particular horse has a 1-in-24 chance of winning a race.	PB1 P10 • Gives explanation indicating that all horses have an equal chance of winning. 1
(ii) ${}^{24}P_2 = 24 \times 23 = 552$	PB3 H10 • Correctly gives value 1
(b) (i) $P(\text{striped}) = \frac{4}{6} = \frac{2}{3}$	PB4 H10 • Correctly gives probability expressed as a decimal, fraction or percentage 1
(ii) $P(\text{striped then white}) = \frac{2}{3} \times \frac{1}{6} = \frac{1}{9}$	PB3 H10 • Correctly gives probability 1
(iii) $P(\text{same colour each time})$ $= \left(\frac{2}{3}\right) \times \left(\frac{2}{3}\right) + \left(\frac{1}{6}\right) \times \left(\frac{1}{6}\right) + \left(\frac{1}{6}\right) \times \left(\frac{1}{6}\right)$ $= \frac{18}{36}$ $= \frac{1}{2}$	PB3 H10 • Correctly gives probability 2 • Makes a substantial effort towards achieving the answer including correct probabilities for each colour 1
(iv) $P(\text{First player has five goes}) = \left(\frac{1}{2}\right)^4 = \frac{1}{16}$ The probability of five spins means the 2nd, 3rd, 4th and 5th spins are the same.	PB4 H6 • Correctly gives calculation of probability using correct/incorrect answer to part (iii) 2 • Uses answer to part (iii) in attempt to calculate correct probability. 1
(c) (i) Width = 40 metres	M5 H10 • Correctly gives answer. 1
(ii) $A \cong \frac{10}{3}(0 + 4 \times 15 + 10) + \frac{10}{3}(10 + 4 \times 7 + 0)$ $= 360 \text{ m}^2$	M5 H6 • Correctly gives answer. 2 • Correctly shows substitution into Simpson's Rule with incorrect calculation 1
(iii) $\frac{5 \text{ km}}{\text{h}} = \frac{5000 \text{ m}}{60 \text{ min}} = \frac{2500}{3} \text{ m every 10 minutes}$ $\text{Volume} = \frac{2500}{3} \text{ m} \times 360 \text{ m}^2 = 300\,000 \text{ m}^3$ $\text{Volume} = 300\,000\,000 \text{ litres every 10 minutes}$	M5 H6, H7 • Correctly gives calculation and answer from correct/incorrect answer to part (ii) 2 • Gives calculation of $\frac{2500}{3}$ metres of cross-sectional area passing in 10 minutes. OR • Correctly gives conversion to Litres from incorrect calculation. 1

Question 25

Sample answer	Syllabus outcomes and marking guide
(a) (i) $5 \text{ min } 20 \text{ sec} = \frac{16}{3} \text{ min}$ $\text{Strokes} = \frac{16}{3} \times 36 = 192$	M1 P6 • Correctly gives number of strokes 1
(ii) $\text{Distance} = \frac{2000}{192} = 10.416666\dots \text{ metres}$	M1 P6 • Correctly gives calculation of distance per stroke using correct/incorrect answer to part (i) 1
(iii) $\text{Speed} = \frac{2000 \text{ m}}{5.3 \text{ min}} = 375 \text{ m/min}$ $= 22500 \text{ m}/60 \text{ min} = 22.5 \text{ km/h}$	M1 P6 • Correctly gives calculation of average speed 2 • Correctly gives calculation of speed in m/min or km/min 1
(b) (i) $l = \frac{k}{d^2}$ i.e. $2 = \frac{k}{100}$, $k = 200$	AM4 H4 • Correctly gives answer of 200 1
(ii) $l = \frac{200}{5^2} = 8$	AM4 H4 • Correctly gives answer from substitution of $d = 5$ and answer to part (i) 1
(iii) $1 = \frac{200}{d^2}$ $\therefore d^2 = 200$ $\therefore d = 14.14 \text{ metres to 2 decimal places.}$	AM4 H4 • Correctly gives calculation for d using answer to part (i) 2 • Shows calculation error following correct substitution 1
(c) (i) $36 \times 3 = \$108$	FM1 P8 • Correctly gives answer of \$108 1
(ii) $3 \times 36 + 2 \times 60 = \228	FM1 P8 • Correctly gives answer of \$228 1
(iii) $\frac{\$228}{5} = \45.60	FM1 P8 • Correctly gives calculation from correct/incorrect answer to part (ii) 1
(iv) $\frac{1000 \text{ g}}{7 \text{ g}} = 142.857\dots, \frac{\$45.60}{142.857\dots} = \$0.3192\dots$ $= 0.32/\text{cup}$	FM1 P8 • Correctly gives calculation of cost per cup from correct/incorrect calculation of cost per kilogram answer in part (iii) 2 • Correctly gives calculation of number of coffees that can be made from 1 kilogram of the blend 1

Question 26

Sample answer	Syllabus outcomes and marking guide
<p>(a) $P = \\$5000$</p> $\frac{(i = 4\% \text{ p.a.})}{4} = 1\% \text{ per quarter} = 0.01$ <p>$n = 5 \text{ years} \times 4 \text{ quarters} = 20$</p> $A = \$5000(1 + 0.01)^{20}$ $= \$6100.95$	<p>FM2 P8</p> <ul style="list-style-type: none"> Correctly gives calculation of Option 2 maturity. 2 Correctly gives conclusion. Accept mark for correct conclusion based on incorrect calculation of Option 2 maturity 1
<p>(b) (i) ratio of $3 : 5 : 6 = 3 + 5 + 6$ parts = 14 parts</p> $\therefore \text{length of 1 part} = \frac{4.2 \text{ km}}{14} = 0.3 \text{ km}$ <p>$\therefore AB = 3 \times 0.3 \text{ km} = 0.9 \text{ km}$</p> <p>$BC = 5 \times 0.3 \text{ km} = 1.5 \text{ km}$</p> <p>$AC = 6 \times 0.3 \text{ km} = 1.8 \text{ km}$</p>	<p>M6 H6</p> <ul style="list-style-type: none"> Correctly gives distances 3 Correctly gives calculation of distances from incorrect unit value 2 Correctly adds the parts of the ratio together 1
<p>(ii) $5 \text{ knots} = 5 \times 1.852 \text{ km/h} = 9.26 \text{ km/h}$</p> $\frac{4.2 \text{ km}}{9.26 \text{ km/h}} = 0.45356\dots\text{h}$ $\approx 27 \text{ minutes (to the nearest minute)}$	<p>M6 H6</p> <ul style="list-style-type: none"> Correctly gives calculation. Ignore incorrect rounding from correct calculation 1
<p>(iii) Method 1:</p> <p>If $\angle ABC = 90^\circ$, $\triangle ABC$ is a right-handed triangle.</p> <p>\therefore Pythagoras' theorem should apply</p> $\therefore AC^2 = AB^2 + BC^2$ $\therefore 6^2 = 3^2 + 5^2$ $\therefore 36 \neq 34$ <p>$\therefore \triangle ABC$ is not a right-angled triangle</p> <p>$\therefore \angle ABC \neq 90^\circ$</p> <p>Method 2:</p> $\cos B = \frac{1.5^2 + 0.9^2 - 1.8^2}{2 \times 1.5 \times 0.9}$ $= 93^\circ 49'$ <p>$\therefore AB$ is not perpendicular to BC.</p>	<p>M6 H7</p> <ul style="list-style-type: none"> Correctly uses Pythagoras' theorem to prove no right angle exists <p>OR</p> <ul style="list-style-type: none"> Correctly uses the cosine rule to prove no right angle exists 1
<p>(iv) $\cos \angle ACB = \frac{AC^2 + BC^2 - AB^2}{2 \times BC \times AC}$</p> $= \frac{(1.8)^2 + (1.5)^2 - (0.9)^2}{2 \times 1.8 \times 1.5}$ $= \frac{13}{15}$ <p>$\therefore \angle ACB = 29.9^\circ$</p> $= 29^\circ 56'$ <p>\therefore Bearing of A from $C = 360^\circ - 29^\circ 56'$</p> $= 330^\circ 04'T$	<p>M6 H6</p> <ul style="list-style-type: none"> Correctly gives calculation of bearing . . . 2 Makes substantial attempt towards obtaining the answer. <p>OR</p> <ul style="list-style-type: none"> Correctly calculates $\angle ACB$. <p>OR</p> <ul style="list-style-type: none"> Correctly gives bearing from incorrect value for $\angle ACB$ 1

Question 26 (Continued) Sample answer	Syllabus outcomes and marking guide
(c) (i) $134^{\circ}22' - 16^{\circ}22' = 118^{\circ}$	M7 H6 • Correctly gives calculation of 118° 1
(ii) $118^{\circ} \times 4 \text{ minutes} = 472 \text{ minutes}$ $= 472 \div 60 \text{ hours}$ $= 7 \text{ hours } 52 \text{ minutes}$ \therefore the time in Coordinated is 12:52 am 11 August.	M7 H6, H7 • Correctly gives calculation for time and date from correct/incorrect answer to part (i) 1
(iii) $48^{\circ}15' + 22^{\circ}25' = 70^{\circ}40'$ $2 \times \pi \times 6400 \times \frac{70^{\circ}40'}{360^{\circ}} = 7893.54 \text{ km}$ $= 7894 \text{ km to nearest km}$	M7 H6 • Gives correct answer to nearest whole km 2 • Correctly adds angles together. 1

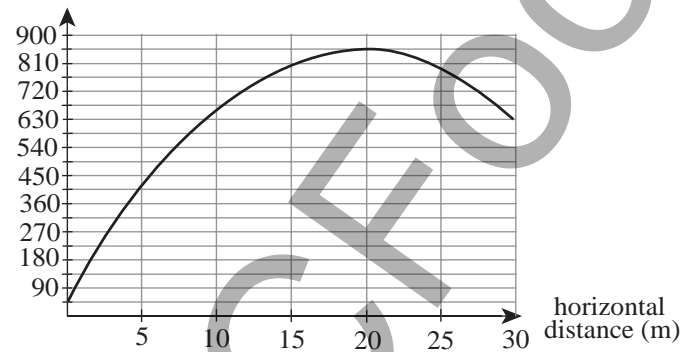
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Question 27

Sample answer	Syllabus outcomes and marking guide
<p>(a) $M = \\$50$</p> <p>$r = 8\% \text{ p.a.} \div 12 = \frac{2}{3}\% \text{ per month}$</p> <p>$= 0.0067 \text{ (to 4 decimal places)}$</p> <p>$n = 21 \text{ years} \times 12 \text{ months} = 252$</p> $A = \$50 \left[\frac{(1 + 0.0067)^{252} - 1}{0.0067} \right]$ $= \$50 \left[\frac{5.3357 - 1}{0.0067} \right]$ $= \$50 \times 650.36$ $= \$32517.94$	<p>FM5 H8</p> <ul style="list-style-type: none"> • Correctly gives answer. 2 <hr/> <ul style="list-style-type: none"> • Makes substantial attempt by adjusting rate and number of periods correctly 1
<p>(b) (i) gradient of line = $\frac{2}{7}$ and the vertical axis intercept = 2</p> $y = mx + b$ $\therefore y = \frac{2}{7}x + 2$ <p>or $2x - 7y + 14 = 0$</p>	<p>DA7 H9</p> <ul style="list-style-type: none"> • Correctly gives answer. 2 <hr/> <ul style="list-style-type: none"> • Correctly gives calculation of gradient. <p>OR</p> <ul style="list-style-type: none"> • Correctly gives equation from incorrect gradient 1
<p>(ii) Lower third: M_1</p> <p>x-value = Median of 3, 5, 7, 7 = 6</p> <p>y-value = Median of 1, 3, 3, 5 = 3</p> <p>$\therefore M_1 = (6, 3)$</p> <p>Upper third: M_3</p> <p>x-value = Median of 15, 16, 16, 17 = 16</p> <p>y-value = Median of 2, 5, 6, 7 = 5.5</p> <p>$\therefore M_3 = (16, 5.5)$</p>	<p>DA7 H9</p> <ul style="list-style-type: none"> • Correctly gives calculation of both median points. 2 <hr/> <ul style="list-style-type: none"> • Correctly gives calculation of one median point 1
<p>(iii) Gradient of new line = $\frac{\text{change in } y \text{-value}}{\text{change in } x \text{-value}}$</p> $= \frac{5.5 - 3}{16 - 6}$ $= \frac{2.5}{10}$ $= \frac{1}{4}$	<p>DA7 H9</p> <ul style="list-style-type: none"> • Correctly gives calculation of new gradient using correct/incorrect values from part (ii). 1
<p>(c) (i) Area of metal recycled</p> $= (142 \times 120) - 8\pi \times 23^2$ $= 3744.77989 \text{ m}^2$ $= 3744.78 \text{ m}^2 \text{ to 2 decimal places}$	<p>M5 H6</p> <ul style="list-style-type: none"> • Correctly gives calculation of metal recycled 2 <hr/> <ul style="list-style-type: none"> • Correctly gives calculation of rectangular sheet. <p>OR</p> <ul style="list-style-type: none"> • Correctly gives calculation of one circle cut out 1

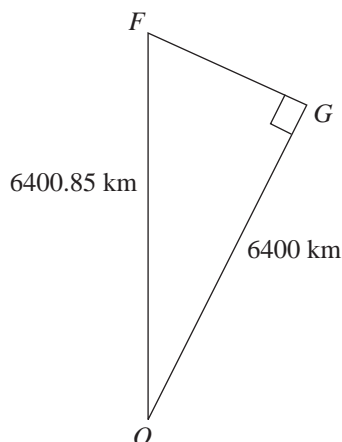
Question 27 (Continued) Sample answer	Syllabus outcomes and marking guide
(ii) New area of metal recycled $= (211.6 \times 80) - 8\pi \times 23^2$ $= 3632.77989 \text{ m}^2$ $= 3632.78 \text{ m}^2$ to 2 decimal places	M5 H6 • Correctly gives calculation of metal recycled 1
(iii) Difference in metal recycled $= 3744.78 - 3632.78$ $= 112 \text{ m}^2$ Percentage of the original amount recycled this difference represents $= \frac{112}{3744.78}$ $= 2.99\%$ $\cong 3\%$ Therefore, with the new shaped metal, 3% less metal is recycled. Hence -3% of the original amount of metal recycled.	M5 H7 • Correctly gives calculation change in metal recycled and relating answer to a -3% change 2 • Correctly gives calculation of change in recycled metal from correct/incorrect area calculation in parts (i) and (ii) 1
(iv) The amount of metal purchased for the same price is reduced, hence the -3% change in metal available for recycling indicates an increase in the price of metal.	M5 H6 • Correctly gives statement relating percentage drop in metal recycled with no price change represents an increase in the price of the metal 1

Question 28

<p>(a) (i) 4 strings were tested incorrectly</p>	<p>PB4 H10 • Correctly gives answer of 4 strings 1</p>														
<p>(ii) 4 strings tested incorrectly 176 strings tested in total ∴ percentage incorrect = $\frac{4}{176} \times 100\%$ = 2.27% This is greater than acceptable 2% Therefore the machine needs a service.</p>	<p>PB4 H10 • Correctly gives calculation of percentage from correct/incorrect value in part (i) with correct conclusion 2 • Gives incorrect calculation of percentage from correct/incorrect value in part (i) with correct conclusion 1</p>														
<p>(iii) P(consistent thickness from rejected pile) = $\frac{3}{17}$ = 17.6%</p>	<p>PB4 H10 • Correctly gives calculation of probability as a fraction, decimal or percentage. 1</p>														
<p>(b) (i)</p> <table border="1" data-bbox="336 869 874 949"> <tbody> <tr> <td>x</td> <td>0</td> <td>5</td> <td>10</td> <td>15</td> <td>20</td> <td>25</td> </tr> <tr> <td>h</td> <td>50</td> <td>400</td> <td>650</td> <td>800</td> <td>850</td> <td>800</td> </tr> </tbody> </table>	x	0	5	10	15	20	25	h	50	400	650	800	850	800	<p>AM4 H3 • Correctly completes table 2 • Gives partially correct completion with no more than two mistakes 1</p>
x	0	5	10	15	20	25									
h	50	400	650	800	850	800									
<p>(ii)</p> <p>Graph showing height of flare above ground</p> 	<p>AM4 H3 • Correctly shows graph from tables of values. 2 • Correctly shows plots from table of values joined with straight lines with correct graph passing through (0,0) 1</p>														
<p>(iii) When horizontal distance = 0, the height of the flare is 50 m. Therefore the structure is 50 m high.</p>	<p>AM4 H4 • Correctly identifies height at $x = 0$ from table of values as being the height of the structure. 1</p>														

Question 28 (Continued)

- (iv) Maximum height h of the flare above the ground is 850 m.



$$FG^2 = FO^2 - GO^2$$

$$FG = \sqrt{(6400.85)^2 - (6400)^2}$$

$$FG = 104.3 \text{ km to one decimal place}$$

- (v) $SG = 2 \times \pi \times 6400 \times \frac{0^\circ 56'}{360^\circ}$
 $= 104.25 \text{ km}$
 $= 104 \text{ km to nearest whole km}$

- (vi) $\frac{104.25 \text{ km}}{24 \text{ km/h}} = 4.34 \text{ h}$
 $= 4 \text{ hours } 21 \text{ minutes to nearest minute}$

Therefore the ship at G will reach ship at S within 4 hours and 30 minutes.

OR if student uses rounded answer to part (v):

$$\text{Time from } G \text{ to } S = \frac{104 \text{ km}}{24 \text{ km/h}}$$

$$= 4.\dot{3} \text{ hours}$$

$$= 4 \text{ hours } 20 \text{ minutes}$$

M4 H6

- Correctly gives calculation of FG obtained from adding the maximum height of the flare from part (i) to the Earth's radius to obtain FO 1

M7 H6

- Correctly calculates SG . Allow mark for unrounded answer 1

M7 H7

- Correctly gives conclusion from correct calculation 2

- Gives incorrect conclusion from correct calculation.

OR

- Gives correct conclusion from incorrect calculation 1